

# Information Technology Curricular Guidelines

**John Impagliazzo**

Hofstra University  
Hempstead, New York

Discipline Council Meeting  
CUNY Graduate Center  
Science Center, Room 4201  
2018 March 2, 09:00-13:00

# Outline

- **IT2017 report highlights (Baccalaureate)**
- IT2014 report highlights (Associate)
- Discussion

# IT2017 Report - [it2017.acm.org](http://it2017.acm.org)

## Vision

*Sought-after* and *durable* set of *guidelines* for use by **educational institutions around the world** to help them develop **IT curricula for the next ten years.**

## Mission

Produce *globally* accepted document of *IT competencies* appropriate for undergraduate degree programs that meets the growing demands of the changing technological world and is **useful for both industry and academia.**

# IT Discipline

Information Technology is the study of ***systemic approaches*** to **select, develop, apply, integrate,** and **administer *secure computing technologies*** to enable users to accomplish their personal, organizational, and societal goals.

# IT Competencies

IT COMPETENCIES = (KNOWLEDGE + SKILLS + DISPOSITIONS) IN CONTEXT

## KNOWLEDGE

- Mastery of content knowledge
- Transfer of learning

## SKILLS

- Capabilities and strategies for higher-order thinking
- Interactions with others and world around

## DISPOSITIONS

- Personal qualities (socio-emotional skills, behaviors, attitudes) associated with success in college and career

## PROFESSIONAL CONTEXT

- Workplace-bound
- Employer involvement
- Expert mentorship
- Authentic problems
- Relevant IT aspects of work
- Collaborative
- Project-based
- Diverse teams
- Reflective practice
- Professional tools

# IT Competency Domains

## 10 Essential Domains (40%)

- ITE-CSP **Cybersecurity Principles** (6%)
- ITE-GPP **Global Professional Practice** (3%)
- ITE-IMA **Information Management** (6%)
- ITE-IST **Integrated Systems Technology** (3%)
- ITE-NET **Networking** (5%)
- ITE-PFT **Platform Technologies** (1%)
- ITE-SPA **System Paradigms** (6%)
- ITE-SWF **Software Fundamentals** (4%)
- TTE-UXD **User Experience Design** (3%)
- ITE-WMS **Web and Mobile Systems** (3%)

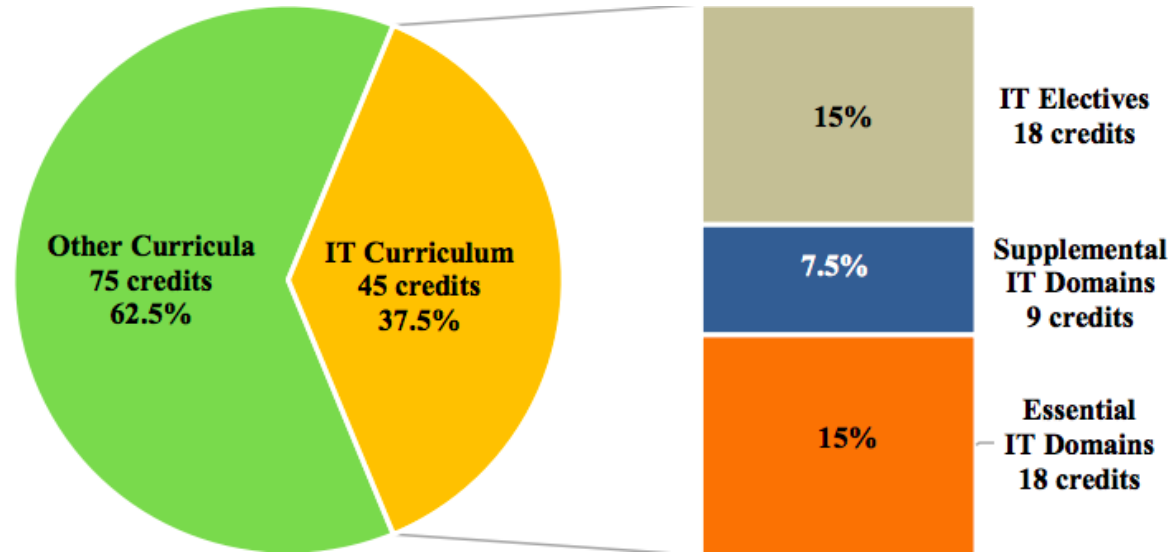
## 9 Supplemental Domains (20%)

- ITE-ANE **Applied Networks** (4%)
- ITE-CCO **Cloud Computing** (4%)
- ITE-CEC **Cybersecurity Emerging Challenges** (4%)
- ITE-DSA **Data Scalability and Analytics** (4%)
- ITE-IOT **Internet of Things** (4%)
- ITE-MAP **Mobile Applications** (3%)
- ITE-SDM **Software Development Management** (2%)
- ITE-SRE **Social Responsibility** (2%)
- ITE-VSS **Virtual Systems and Services** (4%)

## Free IT Electives (40%)

Additional IT competencies

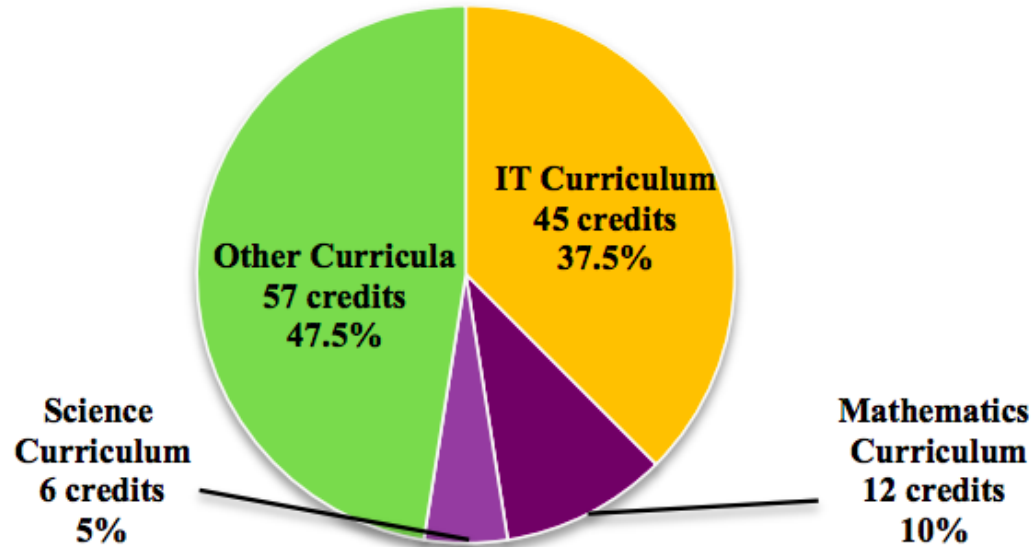
# Example: IT Curriculum of a Baccalaureate IT Program of 120 credits



At least **1.5 years of IT studies**

- $1.5 * 120 \text{ credits} = 45 \text{ credits}$  (37.5% of degree program curriculum)

# Example: IT Curriculum of a Baccalaureate IT Program of 120 credits



At least **1.5 years of IT studies**

- $1.5 * 120 \text{ credits} = 45 \text{ credits}$  (37.5% of degree program curriculum)
- At least 12 credits Mathematics curriculum (10%) and 6 credits Science curriculum (5%)



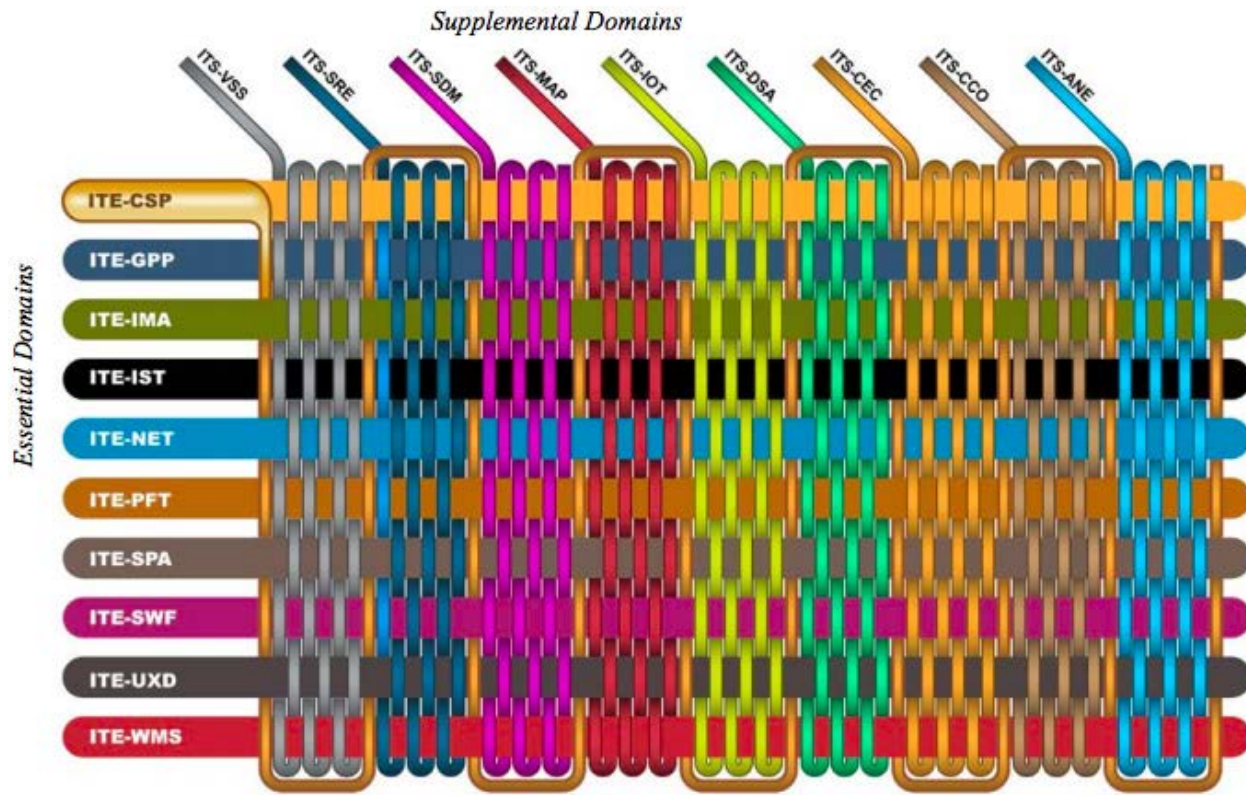
# IT2017 Curricular Framework

IT Domains	Essential Percent	Supplemental Percent
<b>Essential Only</b>		
Information Management	6%	0
Integrated Systems Technology	3%	0
Platform Technologies	1%	0
System Paradigms	6%	0
User Experience Design	3%	0
<i>Subtotal:</i>	<b>19%</b>	<b>0</b>
<b>Essential + Supplemental</b>		
Cybersecurity Principles / Cybersecurity Emerging Challenges	6%	4%
Global Professional Practice / Social Responsibility	3%	2%
Networking / Applied Networks	5%	4%
Software Fundamentals / Software Development and Management	4%	2%
Web and Mobile Systems / Mobile Applications	3%	3%
<i>Subtotal:</i>	<b>21%</b>	
<b>Supplemental Only</b>		
Cloud Computing	0	4%
Data Scalability and Analytics	0	4%
Internet of Things	0	4%
Virtual Systems and Services	0	4%
<i>Subtotal:</i>	<b>0</b>	
<b>IT2017 TOTAL:</b>	<b>40.0%</b>	

# Example of IT Domain Cluster

ITE-GPP Domain: Global Professional Practice			
<b>Scope</b>		<b>Competencies</b>	
<ol style="list-style-type: none"> <li>1. Importance of identifying and understanding essential skills required for a successful career within the industry, including professional oral and written communication skills.</li> <li>2. Identification of ways teamwork integrates throughout IT and ways IT supports an organization</li> <li>3. Social and professional contexts of information technology and computing, and adherence to ethical codes of conduct</li> </ol>		<ol style="list-style-type: none"> <li>A. Analyze the importance of communication skills in a team environment and determine how these skills contribute to the optimization of organization goals. (<i>Communication and teamwork</i>)</li> <li>B. Evaluate the specific skills necessary for maintaining continued employment in an IT career that involves system development in an environmental context. (<i>Employability</i>)</li> <li>C. Develop IT policies within an organization that include privacy, legal, and ethical considerations as they relate to a corporate setting. (<i>Legal and ethical</i>)</li> <li>D. Evaluate related issues facing an IT project and develop a project plan using a cost/benefit analysis including risk considerations in creating an effective project plan from its start to its completion. (<i>Project management</i>)</li> </ol>	
<b>Subdomains</b>			
ITE-GPP-01	Perspectives and impact [L1]	ITE-GPP-07	Intellectual property [L1]
ITE-GPP-02	Professional issues and responsibilities [L1]	ITE-GPP-08	Project management principles [L1]
ITE-GPP-03	IT governance and resource management [L1]	ITE-GPP-09	Communications [L1]
ITE-GPP-04	Risk identification and evaluation [L1]	ITE-GPP-10	Teamwork and conflict management [L1]
ITE-GPP-05	Environmental issues [L1]	ITE-GPP-11	Employability skills and careers in IT [L1]
ITE-GPP-06	Ethical, legal, and privacy issues [L1]	ITE-GPP-12	Information systems principles [L1]

# IT Curricular Framework

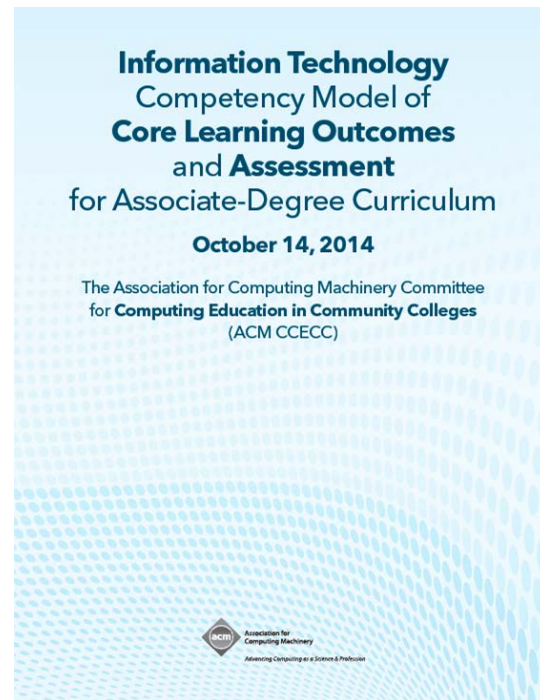


# Outline

- IT2017 report highlights (Baccalaureate)
- **IT2014 report highlights (Associate)**
- Discussion

# ACM CCECC IT Competency Model

- *Information Technology Competency Model of Core Learning Outcomes and Assessment for Associate-Degree Curriculum*
- 2014, ACM Committee for Computing Education in Community Colleges (CCECC)
- **ccecc.acm.org**
- <http://ccecc.acm.org/files/publications/ACMITCompetencyModel14October201420150114T180322.pdf>



# Associate-Degree IT Learning Outcomes (1 of 7)

Table 1: ACM Core IT Learning Outcomes

## *An ability to demonstrate core IT competency in client computing and user support*

- 1 Carry out trouble-shooting strategies for resolving an identified end-user IT problem.
- 2 Differentiate among various operating systems.
- 3 Explain the process of authentication and authorization between end-user devices and computing network resources.
- 4 Identify a variety of assistive or adaptive technologies and universal design considerations.
- 5 Identify basic components of an end-user IT system.
- 6 Implement a hardware and software configuration responsive to an identified scenario.
- 7 Summarize life-cycle strategies for replacement, reuse, recycling IT technology and resources.
- 8 Summarize strategies to support or train users with their IT resources.
- 9 Use a variety of practices for making end-user IT systems secure.

# Associate-Degree IT Learning Outcomes (2 of 7)

*An ability to demonstrate core IT competency in database and information management*

- 10 Describe the data management activities associated with the data lifecycle.
- 11 Diagram a database design based on an identified scenario.
- 12 Differentiate between public and private data.
- 13 Discuss applications of data analytics.
- 14 Discuss issues relevant to dealing with very large data sets, both structured and unstructured.
- 15 Identify database administration tasks.
- 16 Produce simple database queries.
- 17 Use data analytics to support decision making for a given scenario.

# Associate-Degree IT Learning Outcomes (3 of 7)

*An ability to demonstrate core IT competency in digital media and immersive technology*

- 18 Differentiate among a variety of technology-based sensory interactions.
- 19 Differentiate among data types, data transfer protocols and file characteristics specific to the targeted use.
- 20 Illustrate the activities of a digital media design process.
- 21 Implement communication principles into digital media design.

*An ability to demonstrate core IT competency in networking and convergence*

- 22 Carry out basic computer network troubleshooting techniques.
- 23 Describe the layers, protocols and components of the OSI model.
- 24 Diagram the components of an integrated IT system.
- 25 Differentiate among various computer networking models.
- 26 Differentiate among various techniques for making a computer network secure.
- 27 Summarize the flow of data through a computer network scenario.



# Associate-Degree IT Learning Outcomes (4 of 7)

*An ability to demonstrate core IT competency in programming and application development*

28 Demonstrate best practices for designing end-user computing interfaces.

29 Demonstrate the techniques of defensive programming and secure coding.

30 Diagram the phases of the Secure Software Development Lifecycle.

31 Discuss software development methodologies.

32 Summarize the differences among various programming languages.

33 Use a programming or a scripting language to share data across an integrated IT system.

34 Use a programming or a scripting language to solve a problem.13

# Associate-Degree IT Learning Outcomes (5 of 7)

*An ability to demonstrate core IT competency in servers, storage and virtualization*

35 Differentiate among strategies for business continuity provisioning of IT resources at the enterprise level.

36 Discuss data governance and its implications for users as well as IT professionals.

37 Identify a variety of enterprise-level digital storage technologies.

38 Implement an application of virtualization.

39 Modify a system to improve data confidentiality or regulatory compliance.

40 Summarize the implications of various cloud computing models.

41 Summarize the security implications and risks for distributed IT systems.

*An ability to function effectively as a member of a diverse team to accomplish common goals*

42 Use communication, negotiation, and collaboration skills as a member of a diverse team.

# Associate-Degree IT Learning Outcomes (6 of 7)

*An ability to read and interpret technical information, as well as listen effectively to, communicate orally with, and write clearly for a wide range of audiences*

43 Describe the attitudes, knowledge and abilities associated with quality customer service.

44 Produce technical documentation responsive to an identified computing scenario.

45 Use documentation or a knowledge base to resolve a technical challenge in an identified computing scenario

*An ability to engage in continuous learning as well as research and assess new ideas and information to provide the capabilities for lifelong learning*

46 Discuss significant trends and emerging technologies and their impact on our global society.

# Associate-Degree IT Learning Outcomes (7 of 7)

## *An ability to exhibit professional, legal, and ethical behavior*

- 47 Demonstrate professional behavior in response to an ethically-challenging scenario in computing.
- 48 Summarize the tenets of ethics and professional behavior promoted by international computing societies.

## *An ability to demonstrate business awareness and workplace effectiveness*

- 49 Describe IT procurement processes for goods and services.
- 50 Summarize the role of IT in supporting the mission and goals of an organization.

# Community/Technical Colleges

- 46% of all undergraduate students in the **United States** attend community college
- At community colleges,
  - *Computer science* programs are often transfer programs
  - *IT* programs are often career programs, but students still transfer
  - As the number of IT Bachelor's degree programs grows...
- Around the world
  - *Global Perspectives on the Role of Two-Year/Technical/Junior Colleges in Computing Education* ACM, ITiCSE 2016

# 2+2 Baccalaureate Degree Program

- 2 years at community college + 2 years at university
- Community college credits transfer; enters university with “junior” status
- First 2 years, at community college
  - Fundamentals in IT
  - General education
  - Student earns an Associate’s Degree
- Second 2 years, at university
  - Upper-division IT
  - IT electives
  - Some general education

# First Two Years in 2+2

Course Code	Course Name	Credit	Course Code	Course Name	Credit
<b>Semester 1</b>			<b>Semester 2</b>		
MTH 111	College Algebra	3	EC 201	Principles of Economics	3
COMM 111	Public Speaking	3	CIS 278	Data Communications Concepts	3
WR 121	English Composition	3	CIS 133	Intro to Programming C#.NET	3
CIS 145	Micro Computer Hardware	3	BA 206	Management Fundamentals	3
SC xxx	Laboratory Science Elective	3	WR 227	Technical / Professional Writing	3
		<i>Total Credits</i>			<i>Total Credits</i>
		<b>15</b>			<b>15</b>
<b>Semester 3</b>			<b>Semester 4</b>		
CIS 275	Relational Databases & SQL	3	CIS 288	Microsoft Network Administration	3
CIS 244	Systems Analysis	3	PSY 201	Intro to Psychology	3
CIS 233	Programming C#.NET II	3	COMM 215	Small Group Communication	3
BA 211	Principles of Accounting	3	CIS 245	Project Management	3
MTH 244	Statistics	3	ELEC	Elective	3
		<i>Total Credits</i>			<i>Total Credits</i>
		<b>15</b>			<b>15</b>

# Second Two Years in 2+2

Course Code	Course Name	Credit	Course Code	Course Name	Credit
<b>Semester 5</b>			<b>Semester 6</b>		
ACC 325	Finance	3	BUS 457	Business Research Methods	3
BUS 356	Business Presentations	3	HUM xxx	Humanities Elective	3
WRI 350	Documentation Development	3	ELEC	Focused Sequence Elective	3
BUS 226	Business Law	3	ELEC	Focused Sequence Elective	3
ELEC	Focused Sequence Elective	3	ELEC	Focused Sequence Elective	3
<i>Total Credits</i>		<b>15</b>	<i>Total Credits</i>		<b>15</b>
<b>Semester 7</b>			<b>Semester 8</b>		
MGT 461	Lean/Six Sigma Management	3	MIS 498	Senior Project	3
MIS 496	Senior Project Management	3	BUS 478	Strategic Management	3
PSY 347	Organizational Behavior	3	PHL 342	Business Ethics	3
ELEC	Focused Sequence Elective	3	ELEC	Focused Sequence Elective	3
ELEC	Elective	3	ELEC	Focused Sequence Elective	3
<i>Total Credits</i>		<b>15</b>	<i>Total Credits</i>		<b>15</b>



# Mapping of First Two Years to IT2017

<i>Essential Domains</i> <i>Courses</i>	<b>N E T</b>	<b>W M S</b>	<b>I M A</b>	<b>S W F</b>	<b>P F T</b>	<b>I S T</b>	<b>U X D</b>	<b>S P A</b>	<b>C S P</b>	<b>G P P</b>
<i>First Two Years</i>										
CIS 145					1-4			1-3		
CIS 278	1-7									
CIS 133				1-4						
CIS 275			1-7							
CIS 244								1-6		8-10, 12
CIS 233		1-2		1-7		1-2	1-3			
CIS 288	6-7					5			1-3, 8, 12-14	
CIS 245										1-4, 6, 8-12
Subdomains Covered	1-7	1-2	1-7	1-7	1-4	1-2, 5	1-3	1-6	1-3, 8, 12-14	1-4, 6, 8-12

# Challenges

- Community colleges offer advanced courses (third or fourth year content) to prepare students for jobs
- Community colleges offer courses with more of an applied focus (less focus on fundamentals) to prepare students for jobs
- 2-year IT programs require less general education
- Different universities have different requirements

# Outline

- IT2017 report highlights (Baccalaureate)
- IT2014 report highlights (Associate)
- **Discussion**

***Thank You!***